Table 15. Draft Potential Restoration Project List

Location ID	River Mile	Restoration Intent and Needs	Potential Features	Notes/Status
1.0C	0.0 to 1.5	Provide cover for juvenile salmonids; increase complexity without compromising navigation; riparian restoration for long-term cover, food web support, wood recruitment	Work with existing pilings to increase complexity and cover along shoreline; riparian revegetation	Pilings parallel along bankline are providing cover and protecting bank to some extent while also creating undercut banks/holes for refuge/rearing habitat
1.0C Alt	0.0 to 1.5	Provide channel complexity and cover for juvenile salmonid rearing and refuge, without compromising navigation;	Create deeper channels, with stable islands, riparian restoration	Tidal delta would have had distributary channels with extensive cover; Sitka spruce transitioning to brackish marsh and sloughs
0.0L	0	Reconnect historic tidal channels to provide estuary rearing opportunities for juvenile salmonids, riparian restoration	Setback levees, modify tide gates, riparian restoration	Reconnect and restore historic tidal slough channels for estuarine rearing
3.0L	3	Reconnect floodplain and side-channels to provide tidal slough rearing and detrital and primary production to estuary	Setback levees, modify tide gates, riparian restoration	CLT currently doing this project
3.0R	3	Riparian restoration to provide cover, bank stability, and long-term wood recruitment to channel	Riparian plantings suitable to elevation; possible slope back banks if needed	CLT land, supplement on-going restoration
3.1T	3.1	Create habitat node at lower end of MS LB Trib 1; riparian restoration, bank sloping, place cover and structures in-stream to create pools and cover for adult holding and juvenile rearing	Provide cover, bank stability, and long-term LWD	Enhance lower end of trib
4.5T	4.5	Create habitat node at lower end and delta of Impie Creek; riparian restoration, bank sloping for stability, place cover and structures in-stream to create pools and cover for adult holding and juvenile rearing	Provide cover, bank stability, and long-term LWD.	Lack of riparian trees is exaggerating erosion problems in addition to lack of cover
4.7T	4.7	Create habitat node at lower end and delta of Malone Creek; riparian restoration, bank sloping for stability, place cover and structures in-stream to create pools and cover for adult holding and juvenile rearing	Provide cover, bank stability, and long-term LWD	Lack of riparian trees is exaggerating erosion problems in addition to lack of cover
4.7R	4.7 - 4.9	Side channel and floodplain restoration to create off-channel rearing habitat for juveniles and take pressure off of eroding banks on mainstem	Excavate banks and side channel; key to keep channel open is to place structure in-stream at both ends to promote scour. Because this is still tidal, need to be able to scour sands and small gravel	excellent site downstream of bridge for local floodplain restoration, incorporating above
5.0B	5	Side channel and floodplain restoration to create off-channel rearing habitat for juveniles and take pressure off of eroding banks on mainstem	Excavate banks and side channel; key to keep channel open is to place structure in-stream at both ends to promote scour. Because this is still tidal, need to be able to scour sands and small gravel	Opportunity to reduce erosive forces on sharp bend while creating side-channel and riparian restoration, also reduce in-channel sediment deposition
5.0T	5	Create habitat node at lower end and delta of Nikka Creek; riparian restoration, bank sloping for stability, place cover and structures in-stream to create pools and cover for adult holding and juvenile rearing	Provide cover, bank stability, and long-term LWD	Lack of riparian zone
5.5L	5.5	Side channel and floodplain restoration to create off-channel rearing habitat for juveniles and take pressure off of eroding banks on mainstem	Increase total quantity of perennial and ephemeral aquatic refugia and reduce bank erosion	Opportunity to reduce erosive forces and accommodate future sediment deposition by allow annual floodplain connections.
5.0-6.0B	5 -6	Riparian restoration along mile long reach with limited riparian zone; place in-stream structures as appropriate to provide cover for juvenile salmonids and create stable bars/islands	Provide long-term cover and enhance stability of banks with riparian zone; provide structures to stabilize bars/islands and deepen flow-through channels	Provide cover and rearing habitat for chinook and coho in upper end of tidal range. Lower bank is armored with riprap, large alders are falling into channel which will further destabilize banks.
6.5L	6.0-6.5 L	Side channel and floodplain restoration to create off-channel rearing habitat for juveniles and take pressure off of eroding banks on mainstem	Increase total quantity of perennial and ephemeral aquatic refugia and reduce bank erosion	Excellent site for restoration of an anabranching channel that could increase extent and quality of aquatic & riparian habitat several fold.
6.7B	6.7	Side channel and floodplain restoration to create off-channel rearing habitat for juveniles and take pressure off of eroding banks on mainstem	Provide cover, habitat diversity, and reduce erosive forces on sharp bend	Opportunity to reduce erosive forces on sharp bend while creating side-channel and riparian restoration, also reduce in-channel sediment deposition
6.7T	6.7	Create habitat node at lower end and delta of Thadbar Creek; riparian restoration, bank sloping for stability, place cover and structures in-stream to create pools and cover for adult holding and juvenile rearing	Provide cover, bank stability, and long-term LWD	Lack of riparian zone
7.5B	7.5	Side channel and floodplain restoration to create off-channel rearing habitat for juveniles and take pressure off of eroding banks on mainstem	EXISTING PROBLEM SITE: Sedimentation has formed a mid-channel bar which is becoming a vegetated island and contributing to erosion of river banks on either side - a condition that will likely continue. Floodplain easement would allow channel migration to proceed within specific bounds determined by landowners	Right bank actively eroding into field lacking trees. Current depositional zone and eroding banks;opportunity to widen channel to allow river to restore an anabranching morphology (its natural tendency) with setback protection from erosion. Continued deposition at this site could raise flood stages and continued erosion will contribute more sediment to downstream reaches. Channel deformation will proceed upstream and downstream without some sort of action.
7.5 C	7.5	Bar Apex Logjam	Create pool, refugia, and enhance floodplain restoration	This option will be excellent addition only if some version of floodplain restoration at RM 7.5 can be undertaken or stabilization of right and left banks.
7.0-8.0C	7-8 L, R	Provide cover for juvenile salmonids; increase complexity without compromising navigation; riparian restoration for long-term cover, food web support, wood recruitment	Work with existing pilings to increase complexity and cover along shoreline; riparian revegetation	Existing pilings located parallel to bank along much of lower river offer potential means of low-cost LWD placement that could enhance aquatic habitat and improve bank stability.
8.0B	8	Floodplain/side-channel restoration	Provide cover, habitat diversity, and reduce erosive forces on sharp bend	Opportunity to reduce erosive forces on sharp bend while creating side-channel and riparian restoration, also reduce in-channel sediment deposition. Reforestation of floodplain on left bank within sharp bend would provide improve overall benefits but design will need to carefully consider development on right bank.
8.2T	8.2	Riparian restoration and tributary enhancement, lower mile of Hull Creek	Control invasive species. Provide cover, bank stability, and long-term LWD recruitment to important tributary habitat for coho and steelhead	Lack of riparian zone; reed canary grass occupying channel
9.5R	9.3	Side channel and floodplain restoration to create off-channel rearing habitat for juveniles and take pressure off of eroding banks on mainstem	Reconnect existing oxbow(s); excavate connection to channel. Key is to place structures to cause continued scour at entrance and exit	Remenant oxbow wetland located about 700 ft off right bank offers excellent floodplain restoration opportunity.
9.0-10.0B	9.0-10.0	Riparian reforestation	Slope banks back as feasible, replant, place anchored wood for cover along shoreline or integrate with pilings as present	Reach lacking riparian buffer
9.0-10.0C	9.0-10.0	Provide cover for juvenile salmonids; increase complexity without compromising navigation; riparian restoration for long-term cover, food web support, wood recruitment	Work with existing pilings to increase complexity and cover along shoreline; riparian revegetation	Existing pilings located up and down much of lower river offer potential means of low-cost LWD placement that could enhance aquatic habitat and improve bank stability.
9.7R	9.7	Side channel and floodplain restoration to create off-channel rearing habitat for juveniles and take pressure off of eroding banks on mainstem	Provide cover, habitat diversity, and reduce erosive forces	Opportunity to reduce erosive forces while creating side-channel and riparian restoration, also reduce in-channel sediment deposition
10.0R	10	Side channel and floodplain restoration to create off-channel rearing habitat for juveniles and take pressure off of eroding banks on mainstem	Provide cover, habitat diversity, and potential chum channel	Opportunity to reduce erosive forces while creating side-channel and riparian restoration, also reduce in-channel sediment deposition
10.1L	10.1	In-stream structures at confluence of Kings Creek	Trap gravel from Kings Creek for chum spawning	Stabilize sediment and provide spawning habitat and cover; need to ensure doesn't cause bank erosion on opposite bank
10.1T	10.1	Riparian restoration and tributary enhancement, lower end of Kings Creek	Provide cover, bank stability, long-term LWD	
10.5C	10.5	Side channel and floodplain restoration to create off-channel rearing habitat for juveniles and take pressure off of eroding banks on mainstem	Provide cover, habitat diversity, and reduce erosive forces	Provide in-channel habitat, excavate gravel from large bar to provide side-channels
10.5C	10.5	Bar Apex Logjam	Create pool, refugia, and enhance floodplain restoration	This option will be excellent addition to if some version of floodplain restoration at RM 10.5 can be undertaken or stabilization of right and left banks.

Table 15 (continued)

Location ID	River Mile	Restoration Intent and Needs	Potential Features	Notes/Status
11.0R	11	Side channel and floodplain restoration to create off-channel rearing habitat for juveniles and take pressure off of eroding banks on mainstem	Provide cover, habitat diversity, and reduce erosive forces	Opportunity to reduce erosive forces on sharp bend while creating side-channel and riparian restoration, also reduce in-channel sediment deposition
11.2L	11.2	Riparian restoration	Provide cover and bank stability upstream and downstream of covered bridge	Erosion occurring at left bank bridge abutments
11.5T	11.5	Create habitat node at lower end and delta of Klints Creek; riparian restoration, bank sloping for stability, place cover and structures in-stream to create pools and cover for adult holding and juvenile rearing	Provide cover, bank stability, long-term LWD	
11.8R	11.8	Off-channel habitat	Investigate if groundwater sufficient to water channel or if flow-through channel more appropriate	Opportunity to reduce erosive forces while creating side-channel and riparian restoration, also reduce in-channel sediment deposition; investigate chum channel potential
12.0R	12	Floodplain reconnection	Provide cover, habitat diversity, and potential chum channel	Opportunity to provide sediment deposition and off-channel habitat in fallow field; currently floods, but investigate if excavation to lower floodplain warranted or feasible
12.0L	12	Floodplain reconnection	Off-channel habitat, sediment deposition, flood storage	This floodplain is very low and easily lowered further for incremental flood storage and refuge habitat
12.3C	12.3	Evaluate and monitor mid-channel snag, possibly re-locate.	Large snag was deposited in center of channel and providing good local habitat. Snag should be monitored for movement, formation of logjam. If location poses unacceptable risk, snag can be moved to more appropriate location (~RM 12.6)	excellent opportunity to evaluate the role of natural wood recruitment and channel response, developing restoration strategy that works with natural processes
12.5L	12.5	In-channel enhancement: side channel creation (excavation and gravel removal combined with strategic wood placement)	Provide cover, habitat diversity and off-channel rearing and refuge	Opportunity to reduce erosive forces on sharp bend while creating side-channel and riparian restoration, also reduce in-channel sediment deposition
12.6R	12.6	Reconnect off-channel pond	Off-channel habitat and reduce stranding	LCFEG observed fish stranding after two recent floods; is old meander scar
13.5R	12.5 - 13.5	Side-channel and floodplain restoration; potential for groundwater fed channel due to steep slope adjacent	Off-channel habitat, habitat diversity, and cover. Reconnection of right bank floodplain would provide incremental flood storage for downstream communities	Excellent opportunity to restore historic side-channel and also provide sediment storage and reduce erosive forces on main channel. This is a site where sedimentation is already becoming a significant problem and will only continue to get worse. It is a priority site already identified in the sediment budget.
13.5L	13.5	Add in-stream deflectors along road to establish riparian buffer and prevent future riprap placement as has occurred recently	Habitat restoration and prevention of emergency road protection that has degraded habitat.	Relatively easy application to stabilize existing wood and add structure and deflection to improve buffer along road and improve aquatic and riparian habitat.
14.0B	14	In-channel enhancement (bar scalping and wood placement)	Create anabranching section for habitat diversity, restore riparian, provide LWD for sediment trapping, and reconnect old channel	Gorley reach currently actions being designed with BPA funding. Can supplement CREST project by reconnecting old channel for overflow, add'l placement of LWD, riparian restoration, etc.
14.0R	14	Groundwater channel, floodplain fencing, and riparian restoration	Chum spawning and coho rearing channel	Potential to feed via groundwater/hyporheic flow from Grays River and outlet into Crazy Johnson which will also increase Crazy Johnson outlet flow and reduce stranding. A key component will be floodplain roughness and riparian plantings to protect Crazy Johnson from avulsions.
14.0L	14.5	Place in-stream structures and reconnect historic channel south of vegetated island	Habitat diversity, sediment trapping and reconnect old channel for spawning and rearing	
15.0B	15	In-channel enhancement (bar scalping and wood placement)	Create anabranching section for habitat diversity and provide LWD for cover and sediment trapping	Potential to trap some sediment and create off-channel habitats above Gorley reach. Logjams are recommended for Gorely reach to improve development of anabranching channel, sediment storage, sustain pools and side channels.
15.0L	15	Channel connection to wetland	Off-channel rearing and refuge	Needs more investigation to determine elevations and possible connections
18.0B	18.5	In-channel enhancement (bar scalping and wood placement)	Create anabranching section for habitat diversity	Potential to trap some sediment and create diverse confluence habitat above mainstem.
18-21	18-21	Place wood structures to trap sediment	Increase habitat diversity and stabilize channel substrate; retain and trap sediment	Have not identified locations
21C	21	Place wood structures to trap sediment and direct flows. Stabilize existing logjams and construct new logjams	Increase habitat diversity and stabilize channel substrate; retain and trap sediment	
21R	21	Reconnect/restore Alder Creek ponds for off-channel rearing	Steelhead rearing	Provide flow-through or other frequent connection; likely need to maintain ability to use pond for water supplies.
Crazy Johnson 1	Lower mile	Provide in-channel and riparian restoration	Protect and enhance high quality spawning habitat	Potential for limited side-channel development, but do not want to disturb existing high quality habitat
Crazy Johnson 2	Upper area	Create groundwater channel to springs on hillslope to increase flows and provide additional chum spawning habitat	Investigate if groundwater sufficient to water channel; possibility to protect from avulsions	Ground is high floodplain, less susceptible to avulsions, but need to protect to prevent sedimentation of Crazy Johnson Creek
West Fork 2	Lower mile	Floodplain reconnection and placement of wood structures to stabilize sediment	Increase pool habitat in groundwater fed areas which has a high density of spawners and improve channel diversity and trap sediment	
West Fork 1	Lower mile	Remove levees to reconnect former floodplain		
West Fork 3	2.5	Modify hatchery intake to allow unhindered passage	Fish access, rearing, and spawning	Side-channel could be reconnected for juvenile access and reduce stranding
West Fork 4	2.5-3.5	Place wood structures to trap sediment and stabilize bars/islands	Provide cover, channel stability, trap sediment	Extensive old wood buried in floodplain, evidence of effectiveness at trapping sediment
West Fork 5	2.5-3.5	Breach or remove old road grade	Reconnect floodplain and side-channels for rearing and refuge; trap sediment	Close to 50% of floodplain is disconnected at frequent high flows
Fossil Creek 1	0-1	Realign to former channel and riparian restoration	Provide rearing habitat and natural formation of habitats	Floodplain in this area is very low and could provide flood storage and sediment trapping
Fossil Creek 2	Further upstrea	Riparian restoration	Provide cover, bank stability, and long-term LWD	
South Fork 1	0-0.5	Enhance and restore side channels and install wood structures to maintain scour	Provide off-channel habitat, stability and sediment retention.	
South Fork 2	0.5-1	Enhance and restore side channels and install wood structures to maintain scour	Provide off-channel habitat, stability and sediment retention.	
South Fork 3	0-0.5	Place wood structures to trap sediment and provide cover and pool scouring	Provide cover, enhance stability and sediment retention	
South Fork 4	0.5-1	Place wood structures to trap sediment and provide cover and pool scouring	Provide cover, enhance stability and sediment retention	

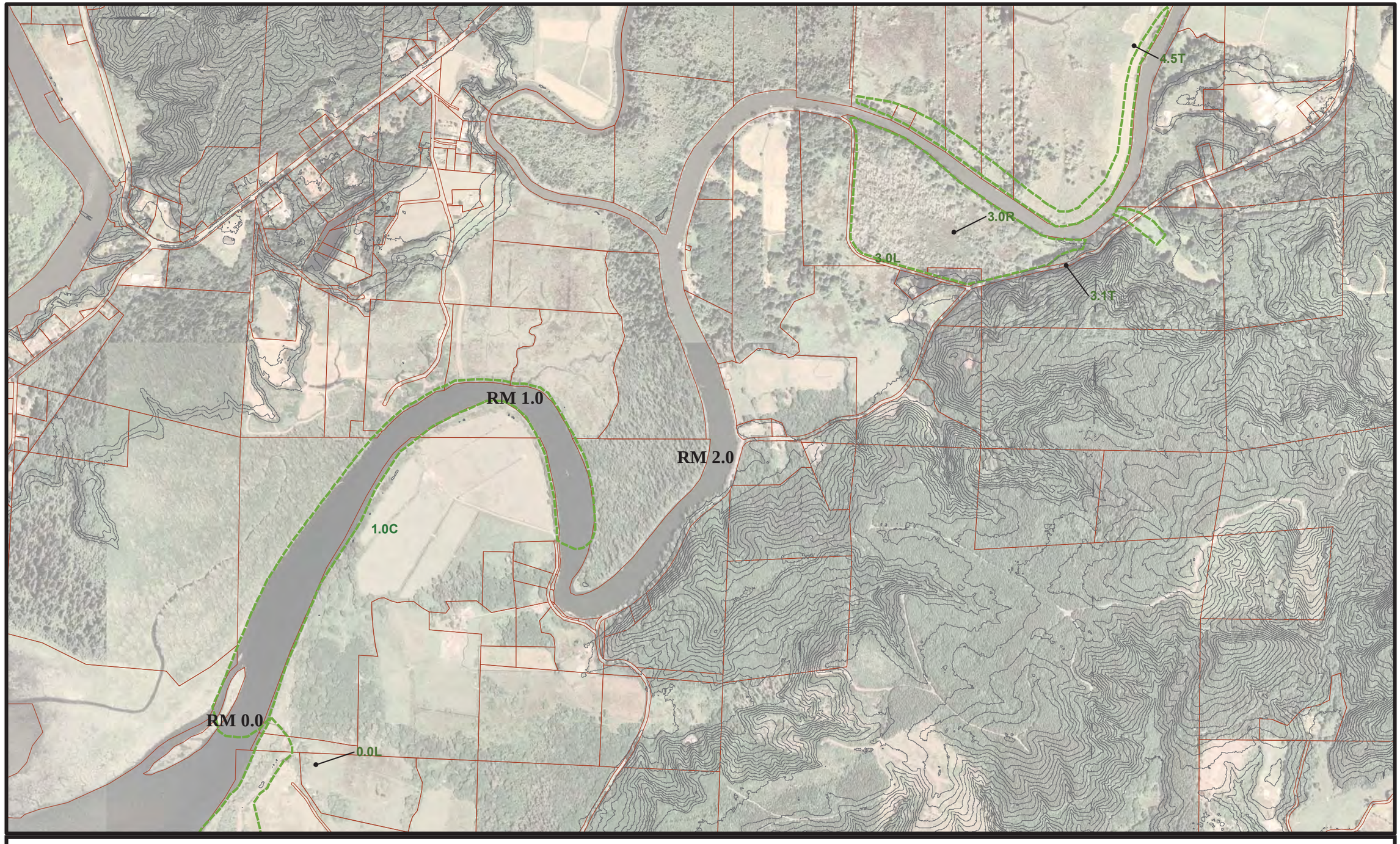

Figure 35. Draft Potential Projects
Grays River Habitat Restoration Technical Report
Reach 1

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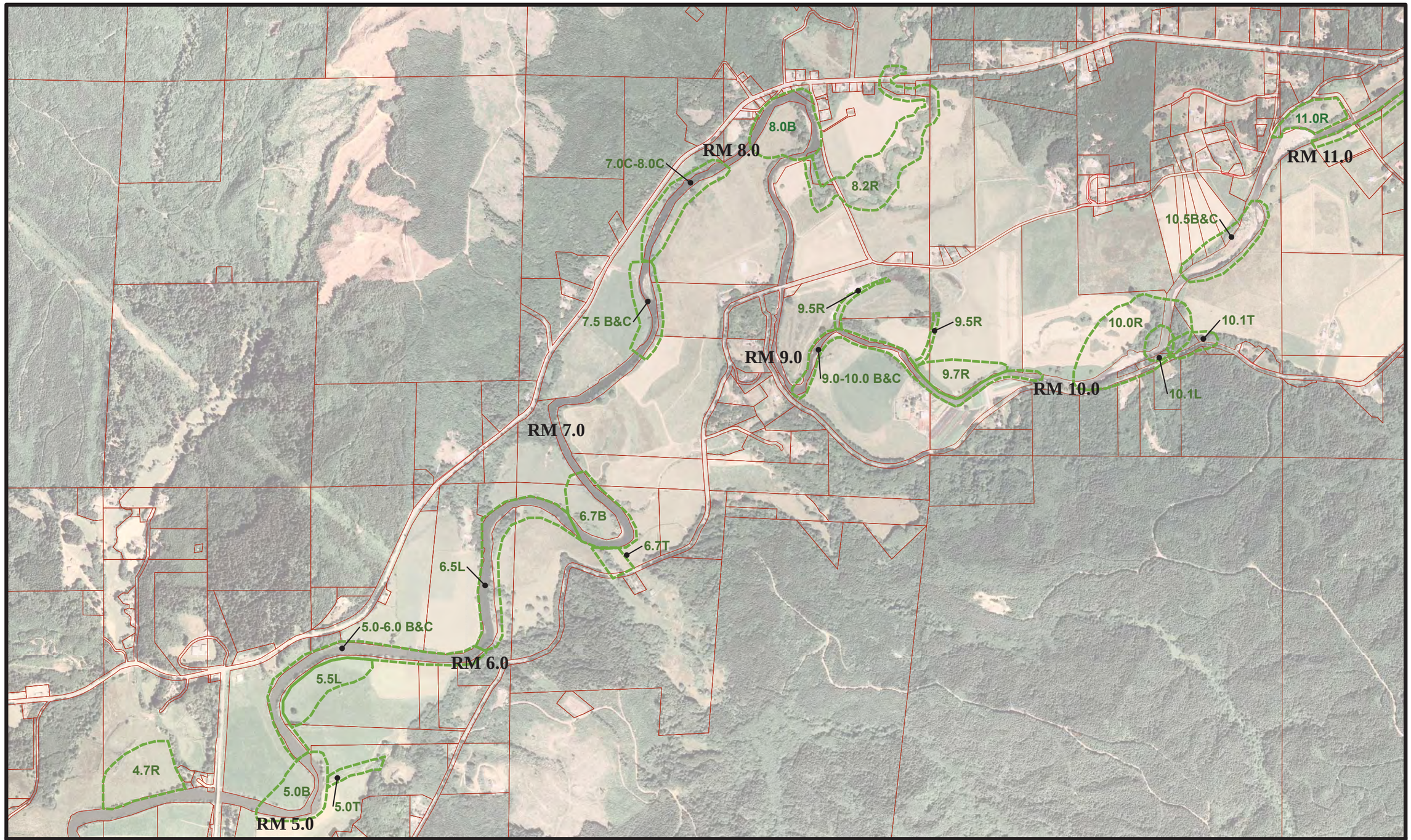

Figure 36. Draft Potential Projects
Grays River Habitat Restoration Technical Report
Reach 2

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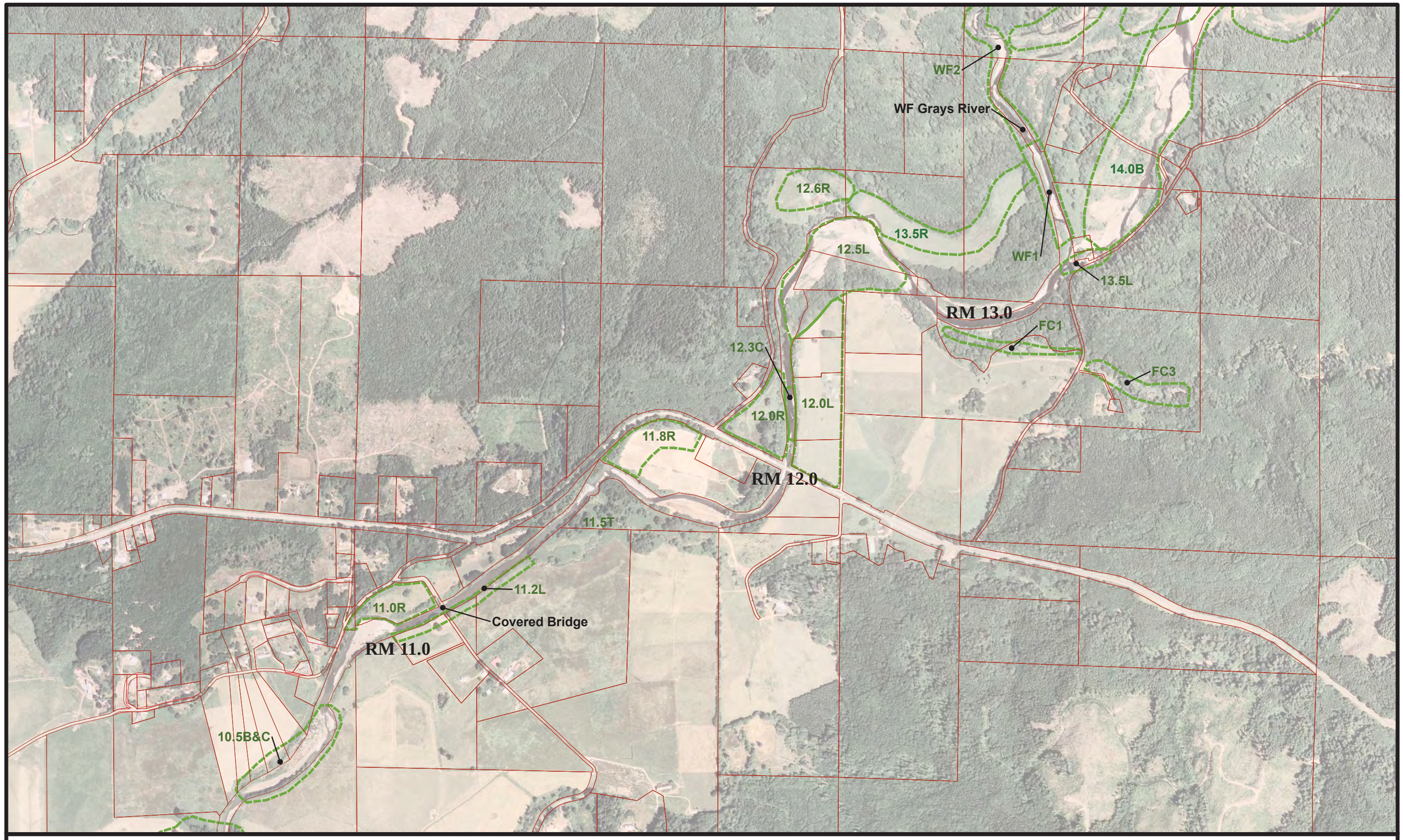

Figure 37. Draft Potential Projects
Grays River Habitat Restoration Technical Report
Reach 3

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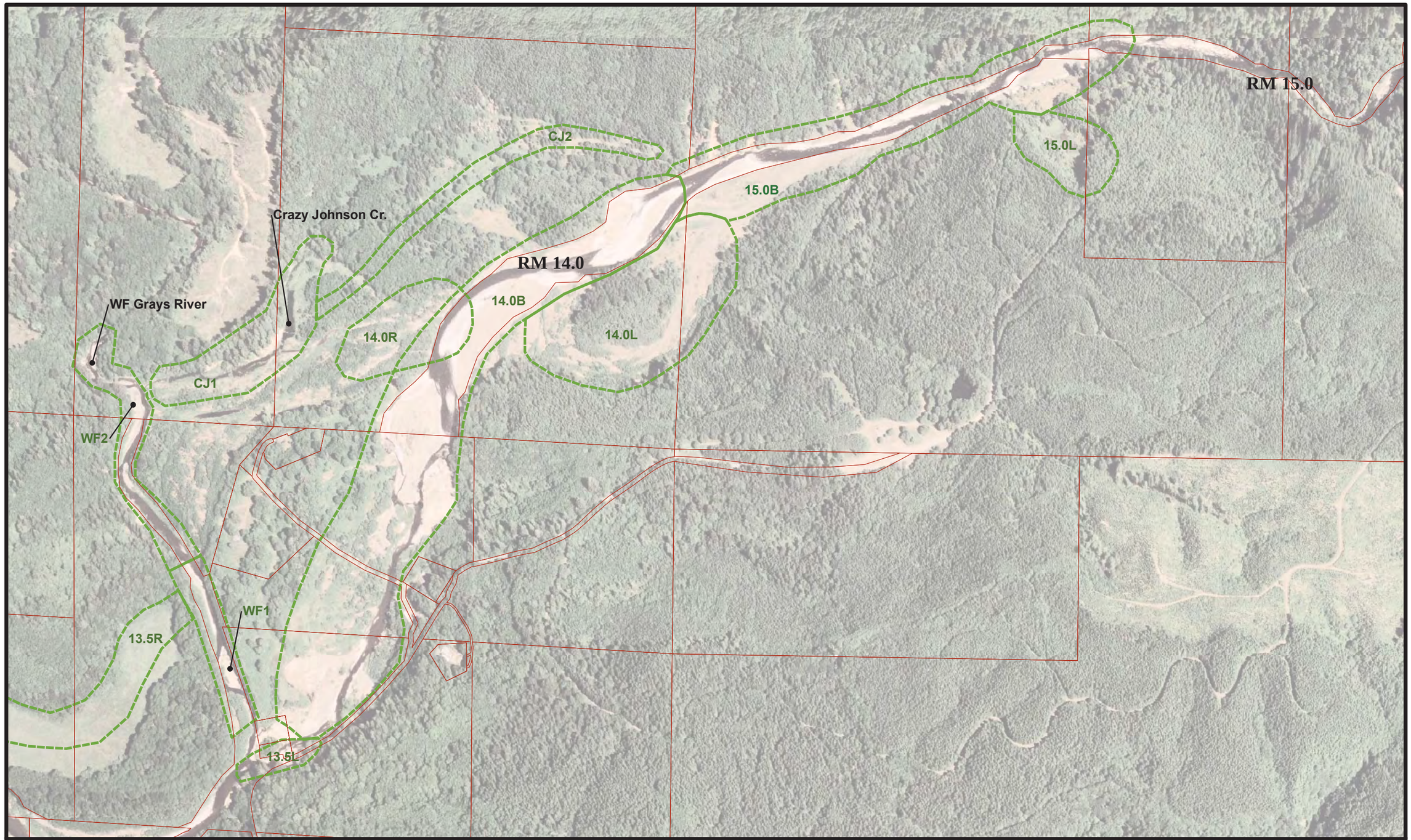

Figure 38. Draft Potential Projects
Grays River Habitat Restoration Technical Report
Reach 4

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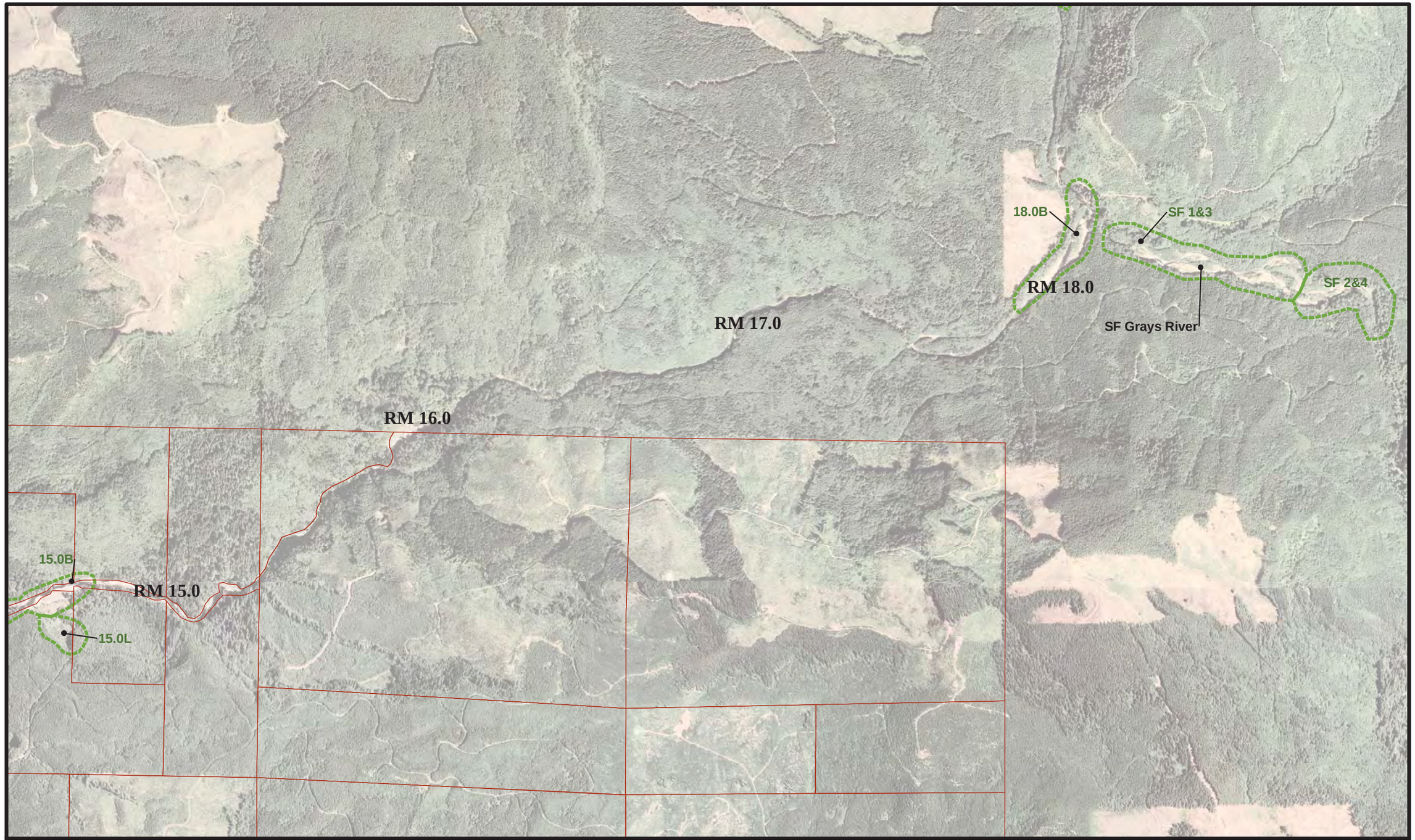

Figure 39. Draft Potential Projects
Grays River Habitat Restoration Technical Report
Reach 5

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Figure 40. Draft Potential Projects
Grays River Habitat Restoration Technical Report
Upper Mainstem Grays / South Fork

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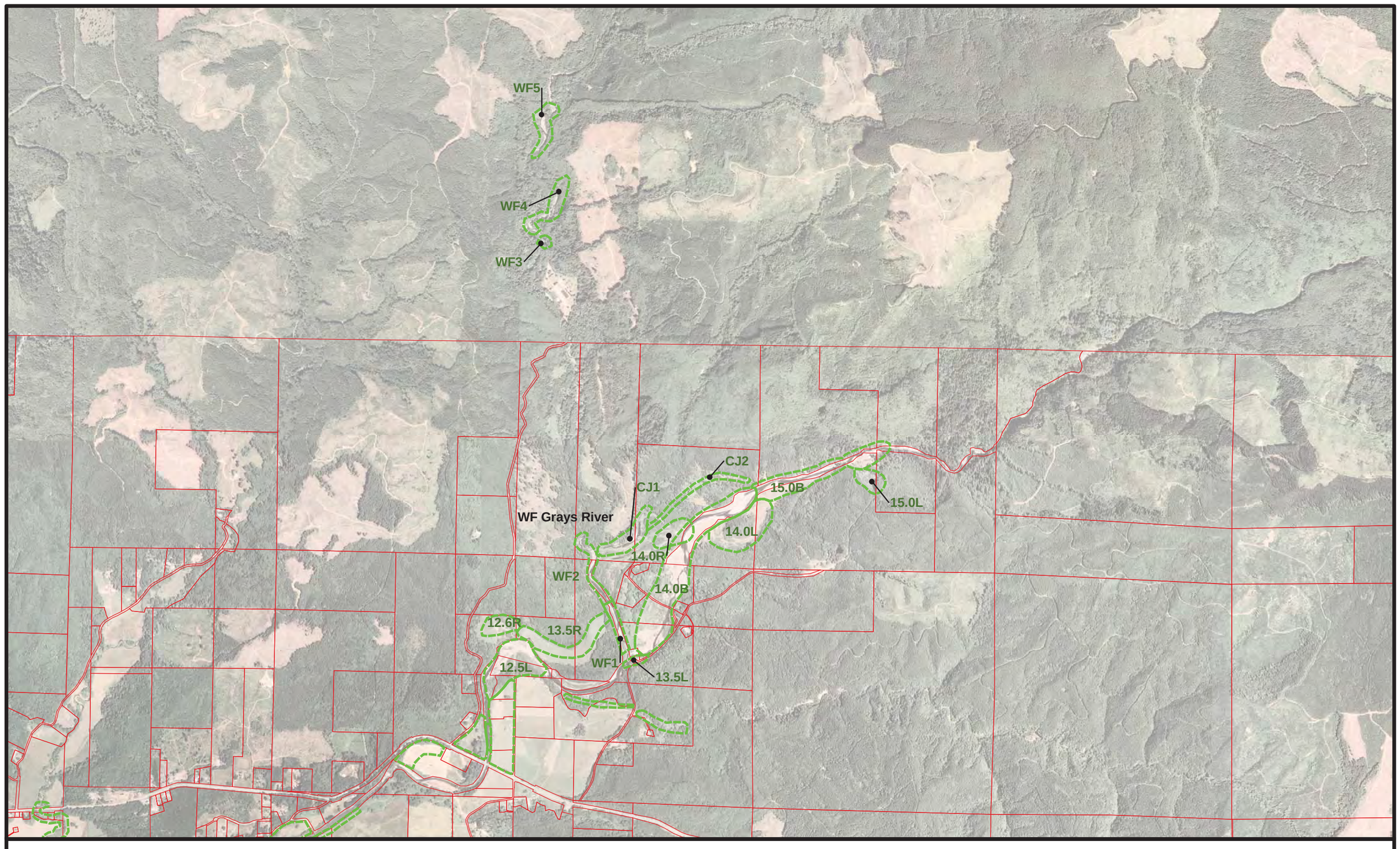

Figure 41. Draft Potential Projects
Grays River Habitat Restoration Technical Report
West Fork

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Table 17. Draft Ranking of Potential Projects.

Project ID	Project Name	Pop/ Reach Score	PAR Score	Total Benefit Score	Preliminary Cost	Pop/Reach Rank	PAR Rank	Overall Priority Grouping
14.0B	In-channel enhancement	21	42.00	63.00	$1,600,000	H	H	1
15.0B	In-channel enhancement	21	30.00	51.00	$1,200,000	H	H	1
13.5R	Side channel and floodplain restoration	21	26.04	47.04	$500,000	H	H	1
14.0L	In-channel enhancement	21	24.00	45.00	$750,000	H	H	1
10.5B	Side channel and floodplain restoration	22	22.50	44.50	$300,000	H	H	1
12.5L	In-channel enhancement	21	18.00	39.00	$600,000	H	H	1
SF1	In-channel enhancement	6	30.00	36.00	$1,100,000	H	H	1
CJ2	Groundwater channel	14	20.00	34.00	$250,000	H	H	1
11.8R	Groundwater channel	21	12.02	33.02	$400,000	H	H	1
F2	Riparian restoration	15	15.00	30.00	$125,000	H	H	1
SF2	In-channel enhancement	6	24.00	30.00	$900,000	H	H	1
11.0R	Side channel and floodplain restoration	22	7.50	29.50	$85,000	H	H	1
CJ1	In-channel enhancement	14	15.00	29.00	$200,000	H	H	1
11.5T	Tributary enhancement	9	18	27.00	$225,000	H	H	1
14.0R	Groundwater channel	21	6.00	27.00	$250,000	H	H	1
12.0L	Floodplain restoration	21	6.00	27.00	$750,000	H	H	1
12.0R	Floodplain restoration	21	4.80	25.80	$700,000	H	H	1
15.0L	Connection to wetland	21	4.50	25.50	$250,000	H	H	1
11.2L	Riparian restoration	22	3.02	25.02	$35,000	H	H	1
10.5C	In-channel enhancement	22	3.00	25.00	$225,000	H	H	1
F1	Floodplain restoration	15	9.00	24.00	$80,000	H	H	1
18.0B	In-channel enhancement	6	18.00	24.00	$600,000	H	H	1
12.6R	Reconnect off-channel ponds	21	2.70	23.70	$150,000	H	H	1
10.1L	In-channel enhancement	22	1.50	23.50	$75,000	H	H	1
13.5L	In-channel enhancement	21	1.50	22.50	$100,000	H	H	1
12.3C	In-channel enhancement	21	0.30	21.30	$100,000	H	H	1
SF3	In-channel enhancement	6	15.00	21.00	$300,000	H	H	1
SF4	In-channel enhancement	6	12.00	18.00	$250,000	H	H	1
9.5R	Side channel and floodplain restoration	19	27.00	46.00	$200,000	M	H	3
7.0-8.0C	In-channel enhancement	16	30.00	46.00	$250,000	M	H	3
10.0R	Side channel and floodplain restoration	19	27.00	46.00	$400,000	M	H	3
7.5B	Side channel and floodplain restoration	16	26.00	42.00	$900,000	M	H	3
9.0-10.0B	Riparian restoration	19	20.10	39.10	$1,000,000	M	H	3
9.7R	Side channel and floodplain restoration	19	15.00	34.00	$250,000	M	H	3
18-21	In-channel enhancement	4	30.00	34.00	$1,500,000	M	H	3
9.0-10.0C	In-channel enhancement	19	7.50	26.50	$125,000	M	H	3
8.0B	Side channel and floodplain restoration	16	9.75	25.75	$350,000	M	H	3
10.1T	Tributary enhancement	13	10.02	23.02	$200,000	M	H	3
6.7T	Tributary enhancement	13	10.02	23.02	$200,000	M	H	3
3.1T	Tributary enhancement	14	7.01	21.01	$110,000	M	H	3
7.5C	In-channel enhancement	16	3.00	19.00	$225,000	M	H	3
21C	In-channel enhancement	4	15.00	19.00	$750,000	M	H	3
21R	Restore Alder Creek pond	4	6.00	10.00	$250,000	M	H	3
WF2	In-channel enhancement	15	30.00	45.00	$700,000	M	M	4
WF4	In-channel enhancement	15	30.00	45.00	$900,000	M	M	4
WF1	Floodplain restoration	15	18.00	33.00	$250,000	M	M	4
WF5	Floodplain restoration	15	12.00	27.00	$150,000	M	M	4
WF3	Modify hatchery intake	15	12.00	27.00	$250,000	M	M	4
0.0L	Restore tidal slough	17	40.00	57.00	$400,000	L	M	5
3.0L	Reconnect floodplain and sloughs	21	26.40	47.40	$500,000	L	H	5
3.0R	Riparian restoration	21	22.50	43.50	$250,000	L	H	5
8.2R	Tributary enhancement	12	25.05	37.05	$400,000	L	H	5
1.0C	Pilings and LWD	17	20.00	37.00	$250,000	L	M	5
1.0C Alt	In-channel enhancement	17	16.00	33.00	$500,000	L	M	5
5.0B	Side channel and floodplain restoration	21	10.50	31.50	$500,000	L	M	5
5.0-6.0B	Riparian restoration	16	13.40	29.40	$1,000,000	L	H	5
4.7R	Side channel and floodplain restoration	21	7.00	28.00	$225,000	L	M	5
6.5L	Side channel and floodplain restoration	16	11.70	27.70	$300,000	L	H	5
4.5T	Tributary enhancement	12	13.02	25.02	$225,000	L	M	5
5.5L	Floodplain restoration	16	7.50	23.50	$250,000	L	H	5
5.0T	Tributary enhancement	13	10.02	23.02	$200,000	L	H	5
6.7B	Side channel and floodplain restoration	16	5.20	21.20	$250,000	L	H	5
4.7T	Tributary enhancement	4	6.01	10.01	$250,000	L	L	5